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# PEST CONTROL

*In Commercial Fruit Plantings*



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In cooperation with Illinois State Natural History Survey

# Contents

	Page
Some Basic Steps In Pest Control . . . .	3-10
Continue Sanitation Practices . . . . .	3
Pruning Is Very Important . . . . .	4
It Pays to Fertilize . . . . .	5
Don't Neglect to Thin Your Fruit . . . . .	6
Be Careful When Using Pesticides . . . . .	7
Grasshopper Control . . . . .	9
Cicada Control . . . . .	9
Rodent Control . . . . .	10
Spray Schedules for Apples . . . . .	12-21
Peaches and Apricots . . . . .	22-25
Spray Schedule for Pears . . . . .	26
Plums . . . . .	27
Spray Schedule for Cherries . . . . .	28
Brambles . . . . .	29
Currants, Gooseberries, Grapes . . . . .	30
Strawberries . . . . .	31
Identification and Compatibility of Pesticides . . . . .	32-33
Key for Identifying New Organic Materials . . . . .	32
Compatibility Chart for Orchard Insecticides and Fungicides . . . . .	33

## IMPORTANT!

This circular will not be revised until 1955. So please keep your copy over the two-year period.

## About the Cover . . .

Forbes and San Jose are the two most common scale insects in commercial apple and peach orchards. Highly magnified pictures on cover show difference in appearance between these two insects. The winter pruning season gives you a good chance to evaluate the scale population in your orchard and to prepare for scale control with the dormant spray (pages 12 and 24).

**AUTHORS (1953):** Dwight Powell, S. C. Chandler, and J. C. McDaniel of the Department of Horticulture, University of Illinois, and the Illinois State Natural History Survey. For helpful criticisms and suggestions the authors are indebted to the late C. J. Weinman, Illinois State Natural History Survey; and to H. W. Anderson, A. S. Colby, and Victor W. Kelley, Department of Horticulture.

# PEST CONTROL

## *In Commercial Fruit Plantings*

THE BATTLE against insects, diseases, and other pests in Illinois orchards must be fought each year. In some orchards it has to be carried on in every season. To help in the fight, various experimental agencies are constantly working out better methods of pest control. This circular brings together the latest recommendations from the Illinois, Kentucky, and Indiana Experiment Stations, the Illinois Natural History Survey, and the U. S. Department of Agriculture. You may need to adjust these recommendations to suit your own conditions—but *don't experiment with untested materials and methods*. To do so may mean disaster.

Pest-control practices are so closely linked with other operations that they cannot be easily separated. This circular therefore has attempted to give recommendations necessary for quality fruit—not just adequate pest control. For efficient operation, orchard practices must be well organized. So you are urged to study the following pages carefully in order to cope better with the many problems that face you as a specialist in agriculture.

## SOME BASIC STEPS IN PEST CONTROL

### Continue Sanitation Practices

With the general use of organic insecticides and fungicides and with the increased cost of hand labor, many growers are omitting sanitation practices. This, however, is generally a mistake. It is practically impossible to secure a high-quality crop when one depends entirely upon chemical treatments. So if at all possible, the following practices should be observed.

#### For codling moth control

1. Remove all rough and loose bark from crotches, trunks, and branches during late winter or spring. Either scrape by hand or use water pressure. Directing a straight stream of water at 500 pounds pressure against the rough bark will clean a mature apple tree in at least 3 minutes.

2. Apply treated bands normally from June 10 to June 30. This will reduce the summer codling moth broods about 50 percent.

3. If possible remove all wormy fruit and destroy. Examine the top third of the tree closely at the end of the first brood.

4. Avoid mulching material coarse enough for a larva to spin a cocoon.

5. Store orchard crates and used baskets in a closed building or at least 5 miles from the orchard. Screen the packing shed if it is near the orchard. These measures keep the adult moths from returning to the orchard the next season.

6. Collect and burn all prunings and other debris. Destroy broken crates and baskets, discarded sacks, weed stems, corn stalks, etc.

7. Store props in a closed building or chemically treat them before the next season.

### For disease control

1. Collect and remove infected fruit.

2. Prune out fire blight infections as they appear, cutting 4 to 6 inches below the last point of visible infection.

3. Remove all dropped fruit from the orchard at regular intervals.

(For bramble sanitation see page 29; for strawberry sanitation, page 31.)

## Pruning Is Very Important

Good pruning is of the greatest importance in good orcharding. A definite annual pruning program will make healthy trees.

For one thing, good pruning is an aid in sanitation. Twigs that have been killed by blight or breakage should be removed to help control frog-eye leaf spot and black rot infections. Also, fire blight infections may be reduced by pruning blighted twigs and cankers. Lateral branches should be cut back so that long tips do not extend beyond the periphery of the tree. Such tips are hard to spray and easily become infected with scab. Thus, they may be a source of spores for secondary infection.

Good pruning is a help in spraying as well as in sanitation. If branches are thinned out and the height of tall trees is reduced (Fig. 1) it is easier to get good coverage of the trees with spray material—and less spray is needed. As already suggested, cutting back lateral branches will also make spraying easier. Such pruning is especially worthwhile in orchards where spraying is done by the non-stop system. It also appears to be of utmost importance in securing maximum efficiency of concentrate sprays.

Other advantages of good pruning are that it reduces the amount of spray required for thorough coverage of each tree and cuts down fruit-thinning costs.

You can save a lot of pruning time by removing water sprouts with a gloved hand in the early summer. At this period of the year water sprouts can be rubbed off a mature tree in less than a minute. Sprouts up to 12 inches in length can be removed by this method.



Fig. 1. — Tops of high trees should be lowered for convenience in spraying and harvesting. Fruit trees should not be allowed to grow more than about 20 feet high. If trees are already too tall, cut leaders back to horizontal lateral branches (see arrows). Too-heavy cutting, exposing too much of the top to the sun, may cause branches to sunscald. Light pruning, when the tree first begins to grow too high, is much better.

### It Pays to Fertilize

Keeping fruit trees in a good state of vigor is necessary for adequate production and good fruit. Trees not in good vigor may be completely destroyed by what are normally considered minor pests. Vigorous trees, on the other hand, are far less likely to be attacked by insects and disease-producing organisms. If they are injured they will generally recover more rapidly and completely than less thrifty trees.

There are no hard-and-fast rules for fertilizing the orchard. It is, however, important to fertilize annually and to maintain a soil-fertility level high enough to support a vigorous cover crop on the orchard floor.

Many growers apply annually only nitrogen fertilizers, such as ammonium nitrate. Approximate rate is  $\frac{1}{4}$  pound for every year of tree age — too much will harm the finish and color of

the fruit. Other growers use complete fertilizers, planning to apply at least 1 or 2 pounds of actual nitrogen per year to mature trees.

Fertilizers may be broadcast either over the entire orchard floor or under the trees only; or they may be spread by hand in a ring under the tree. The last of these methods is the most efficient way to supply nutrients to the tree.

Applications may be made in the fall, in the fall and the spring, or in the spring only. Some growers make summer broadcasts primarily for the cover crop, with the feeling that if the crop is healthy then the soil must be suitable for fruit trees. For most of the heavy soils in Illinois, however, late fall applications are recommended. This will permit the trees to take up the nutrients well ahead of blossoming in the spring.

Many growers are fortunate enough to have manure to supplement the commercial fertilizer program. The important thing is to fertilize regularly each year and maintain good healthy trees. *Fertilizers save money.*

## Don't Neglect to Thin Your Fruit

Getting rid of surplus, defective, and low-quality fruit takes a big load off the tree. Limbs will rise, allowing better air circulation in the tree. Sprays will dry faster, and spray injury will be reduced. Besides fruit will be of better color, size, and quality, and picking costs will be lower.

A number of growers have become interested in **chemical thinning**. This method of thinning apples cannot be generally recommended at this time. Results will vary with variety, tree vigor, concentration of material used, time of application, and weather conditions. For those who want to use thinning sprays, however, the following suggestions are made for guidance.

### Apples

*Hormones* are more practical than dinitro materials because thinning may be done after bloom, when the set can be determined and there is little danger of further thinning by late frosts.

*When heavy set is expected*, use naphthaleneacetic acid hormones as follows:

1. Apply at calyx or 1 week after. Fruit cracking may result on Transparent and Duchess if thinning sprays are made later than 1 week after calyx.
2. If possible, apply the chemicals as a separate spray so that the amount of material can be varied according to tree vigor and amount of bloom. Another reason for applying the thinning spray separately is that insecticides and fungicides may reduce the thinning power.
3. Apply when weather conditions are favorable for drying.
4. For Golden Delicious, Transparent, Rome, and Wealthy, use a concentration of 20 parts per million (double the strength recommended by the manufacturers for preharvest sprays).
5. For Grimes, Duchess, and York, use 15 parts per million ( $1\frac{1}{2}$  times the concentration for preharvest sprays).
6. For Jonathan, Delicious, and Winesap, use 10 parts per million (same concentration as for preharvest sprays) at 1 week after calyx.
7. Remember that it is very easy to over-thin trees low in vigor.
8. Spray thoroughly, but do not over-spray the lower third of the tree, which is less vigorous than the upper part.

## Peaches

Extensive experiments on chemical thinning of peaches were conducted in 1952. Best results were obtained by an application of naphthaleneacetic acid at a concentration of 30 parts per million 2 weeks after the shucks were off. Dry dusts were somewhat less effective than sprays. Wet dusts were somewhat more effective than sprays but also affected the foliage more.

## Be Careful When Using Pesticides

Most pesticides are poisonous. Some are hazardous to the operator who prepares and applies them; some are toxic to plants; some may leave toxic residues that are dangerous to consumers; and a few are hazardous because they tend to contaminate the flavor of foods or feeds. So be sure to observe strict precautions when using pesticides.

The rapid development of new and more effective pesticides has led to greater realization of the hazards of using them, particularly on food or feed crops. Federal regulatory agencies evaluate pesticides for their toxicity — both acute and chronic — and, when necessary, establish tolerances for residues in or on foods. If residues are greater than the tolerances established, the products could be considered contaminated and therefore be subject to confiscation.



Pesticides sold in interstate commerce have been registered and labeled under federal regulations. *Read the labels.* They contain the most accurate information currently available on the specific uses and the hazards of these materials.

Recommendations are for amounts that will give a practical degree of control but at the same time keep toxicity hazards at a minimum. *Do not use more pesticide than needed and do not apply at times when dangerous residues may result.*

**Parathion.** Parathion is an especially deadly poison. So, although it is a highly effective insecticide for many purposes it should not be used where a safer material will give reasonably satisfactory control. Where situations demand it and you can enforce proper precautions its use may be justified.

*It is essential that these precautions be followed in the use of parathion:*

1. **Use only 15-percent wettable powder or 1-percent dust.**
2. **Do not use oil**, as oil increases absorption of parathion by the skin.
3. **Do not spray from the inside of the tree.**
4. **Use mask** to protect lips, nose, and mouth from accumulating residue, especially while emptying parathion sacks into the spray tanks.
5. **Stand out of the drift** when putting the powder into the tank or emptying the sacks of dust into the hopper for dusting.
6. **Do not wash the material through the screen** into the tank. Sift it in quickly with the screen removed.
7. **Do not breathe dust or powder.**
8. **Dust with the wind** and be careful of the turns at the ends of the rows. A duster or sprayer operated by one man with controls at the tractor is safer than the more common, manually operated, two-man outfit.
9. **Wash hands thoroughly** after each contact with the material and before touching the lips, eyes, etc., and before eating any food.
10. **Do not smoke** while spraying or dusting.
11. **Change clothes and bathe** at least daily. Accidentally soaked clothes should be replaced at once.

Atropine is the emergency antidote for parathion poisoning. Keep on hand a supply of atropine tablets (1/120 grain or 0.5 mg.). You will need a doctor's prescription to get them. Never take atropine or similar drugs until AFTER warning symptoms appear. Symptoms of parathion poisoning include headache, blurred vision, weakness, nausea, cramps, diarrhea, and discomfort in the chest. If you feel any symptoms while spraying with



parathion, quit spraying, take two atropine tablets at once, and go to a doctor.

If you cannot rigidly follow ALL precautions, do not use parathion.

**Clinical test.** If you handle organic phosphate insecticides regularly, you should go to your doctor periodically for blood cholinesterase determinations.

## Grasshopper Control

For several years grasshoppers have been troublesome in many orchards. Damage may occur on the foliage of young, nonbearing trees or on the fruit and foliage of bearing trees. To control this pest, use one of the following materials:

	<i>Amount per acre for —</i>		
	<i>Young hoppers</i>	<i>Adult hoppers</i>	<i>Residual toxicity</i>
Chlordane.....	½ lb. actual	1 lb. actual	Excellent
Toxaphene.....	1 ½ lb. actual	2 lb. actual	Excellent
Benzene hexachloride.....	0.3 lb. actual gamma	0.3 lb. actual gamma	Poor
Aldrin.....	2 oz. actual	2 oz. actual	Excellent
Dieldrin.....	1 oz. actual	2 oz. actual	Excellent

## Cicada Control

A brood of the 17-year race of periodical cicada (locust) will emerge in many counties of southern and eastern Illinois in 1953, and may be a serious pest this summer in some of these areas. If your orchard is in a locality where this pest was abundant in 1936, a special spray may be needed, particularly for protection of young fruit trees against damage caused by the female cicadas during egg laying.

A spray containing  $\frac{1}{4}$  to  $\frac{1}{3}$  pint of 30-percent TEPP concentrate in 100 gallons of water is suggested for application in and around blocks where cicada adults are numerous. This is a contact spray, with almost no residual toxicity, so it is necessary to spray usually at night when the cicadas are at rest. Three or four applications may be needed during the period of emergence.

TEPP is an organic phosphate similar to parathion in its toxicity, and the precautions given on pages 8 and 9 for parathion should be followed when using TEPP.

## Rodent Control

Rodents take a heavy toll in killed and damaged trees each year. Definite programs should be adopted for control of these pests as for insects and diseases.

A survey should be made each fall to determine whether mice are present. This can be done by walking up and down the tree rows, watching for mouse runways underneath the grass or mulch on top of the ground, and noting whether there are any small openings extending to runways underneath the soil surface. If there is evidence of mice, prepare for baiting.

During the winter, especially when snow is on the ground and food is scarce, rabbits feed on the tender bark of many kinds of young fruit trees. Protection may be secured by using a mechanical barrier (Fig. 2) or a chemical repellent.

For latest information on rodent control write to the DISTRICT AGENT, DIVISION OF PREDATOR AND RODENT CONTROL, U. S. DEPARTMENT OF INTERIOR, *West Lafayette, Indiana*.

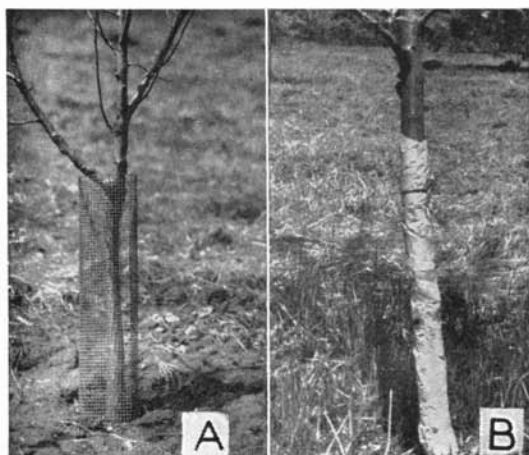
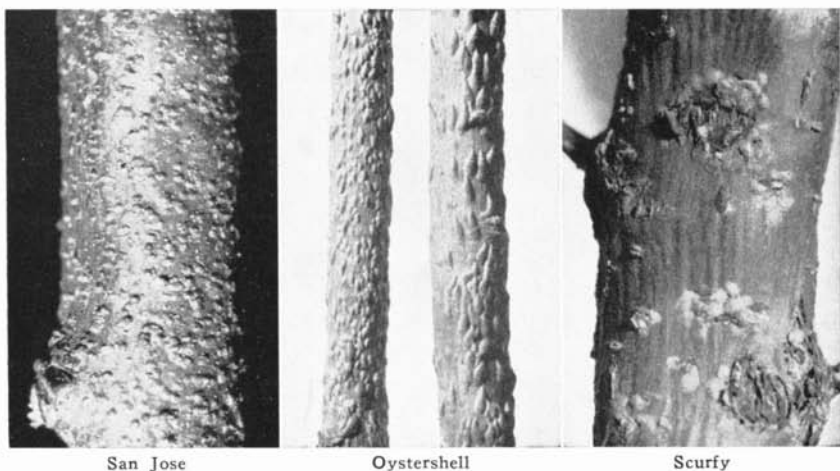


Fig. 2. — Protection of young trees against damage by rodents and insects is very important. Failure to do this, even for one season, may result in the complete loss of many trees. Galvanized gravel screen, 4 meshes per inch, placed around the trunk (A) gives protection against rodents. Wrapping paper tied around the trunk with twine (B) protects against both rodents and wood-boring insects.



San Jose

Oystershell

Scurfy

Fig. 3.—Some important scale insects in Illinois. San Jose scale is one of the most destructive pests in Illinois apple and peach orchards. Forbes scale, shown on cover, has the same general appearance as San Jose scale and is also becoming a major pest on apples and peaches. Oystershell scale is of importance only in the northern half of the state. Scurfy scale causes little damage in well-sprayed orchards.

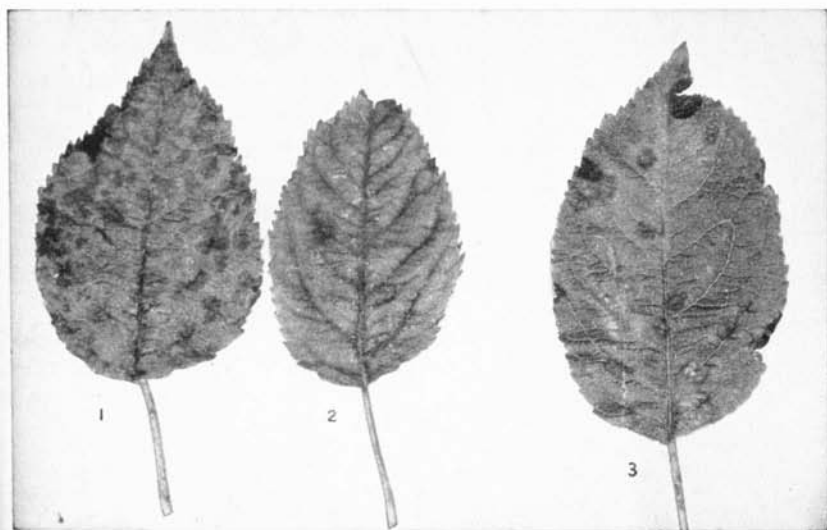


Fig. 4.—Three types of apple scab on leaves. (1) Diffused irregular spots. (2) Spots diffused but especially prominent along leaf veins. The most severe spray injury results when caustic sprays are applied to leaves showing this type of scab. (3) Well-defined spots; note also lesions on leaf stem.

## SPRAY SCHEDULES FOR FALL AND WINTER APPLES

### Dormant Spray

Application and purpose	Time to apply	Materials in 100 gallons of water
For all scale insects, aphids, European red mite	Before the buds are open. Early spring is safest and most effective time	Dormant oil, 3 gal. actual; DNC, 1 lb. actual
For only San Jose and Forbes scale, European red mite	.....	Dormant oil, 3 gal. actual
For green and rosy aphid	.....	DNC, 1 lb. actual
For apple scab (in problem orchards)	.....	"Elgetol" or "Krenite," ½ gal. (apply 500 gal. per acre, to ground only)

The first recommendation above is designed to destroy all insects and mites which are susceptible to chemicals during the dormant period. DNC is an abbreviation for the various dinitro sprays on the market. Other complete dormant sprays, such as "DN 289" and "Elgetol 318," are also available.

The second suggestion may be followed when aphid control is not essential. This spray will destroy the European red mite eggs and the dormant forms of San Jose and Forbes scale. It will not destroy aphid eggs or the dormant forms of oystershell and scurfy scales.

If you are concerned only with aphid control, then use the third alternative—or some other aphid spray. While DNC materials are particularly effective in destroying aphid eggs there are other good dormant sprays on the market. When only the aphid dormant is applied, keep a close watch for early-season development of scale and red mite.

The fourth suggestion is only for growers having scab trouble. Spraying the entire orchard floor will reduce scab inoculum as much as 95 percent. This spray will also make it much easier to guard against later infection.

A **delayed dormant** (Stage 2, Fig. 5) spray containing copper sulfate, 12 pounds, hydrated lime, 12 pounds, and dormant miscible oil, 2 gallons in 100 gallons of water is suggested in blocks where fire blight has been serious and where black rot and other fruit rots are troublesome.

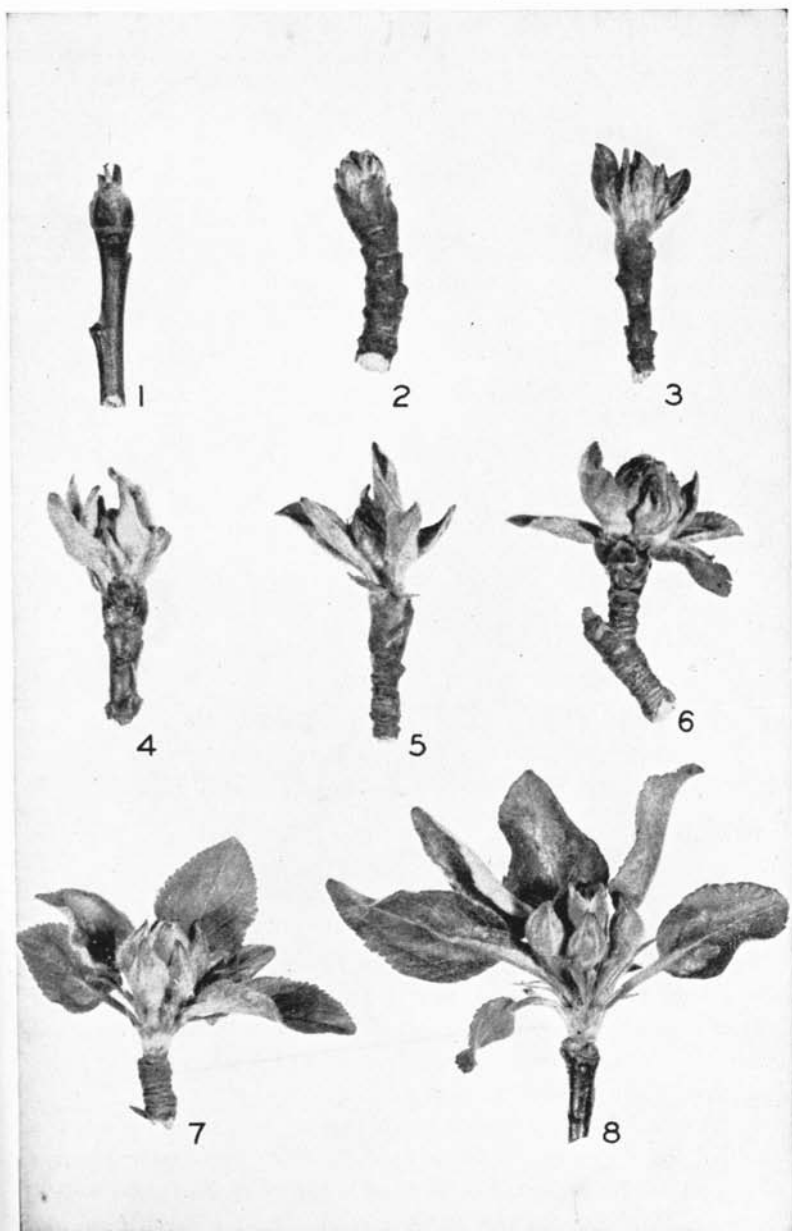


Fig. 5.—Time apple sprays with development of fruit buds. Apply the strictly dormant sprays before Stage 1. Apply delayed dormant sprays during Stage 2. Apply prepink spray between Stages 3 and 6. Start the pink spray at Stage 7 (not later than 8), and complete by the time the first flowers open.

## Prepink Spray

Application and purpose	Time to apply	Materials in 100 gallons of water
For apple scab	Before flower buds show pink ( <i>Fig. 5, Stages 3 through 6</i> )	Liquid lime sulfur, 2 gal. — or — Dry lime sulfur, 8 lb. — or — Organic mercury compound

Apple scab is still the most serious apple disease. Lime sulfur, either dry or liquid, is suggested for this spray because it is readily available and more economical than other materials. It is important to spray the foliage as soon as the buds break open exposing the new leaves. Organic mercury compounds are very efficient in controlling scab. Many growers are using them where sulfur has not been too effective. These materials will definitely eradicate scab and can be applied after infection has occurred, or after a rainy period.

The prepink application is one of the most important sprays on fall and winter varieties because if scab is to be controlled it must not be allowed to get started. More than one prepink application is necessary when weather is cold and rainy.

Sulfur dusts may be used to supplement the sprays.

**Two apple tree borers may cause very serious injury on trees up to about 12 years of age in Illinois.**

**The roundheaded apple tree borer is found mostly in the northern two-thirds of Illinois. It usually burrows in the base of the trunk, anywhere from 2 inches below the ground to a foot or more above. Heavy DDT sprays are being tested on this borer. They cannot yet be recommended, but anyone wanting to try them can get information from the Illinois State Natural History Survey, Urbana.**

**The flatheaded apple tree borer works higher on the trunk and sometimes infests the branches. It nearly always locates on the sunny side of a tree, but may be found on all sides. Weakened trees are especially susceptible. Shading the trunk gives some control. Either wrap it or put two boards, nailed together to form a trough, near the south and west sides. Best protection is to keep trees vigorous.**

## Pink or Cluster-bud Spray

Application and purpose	Time to apply	Materials in 100 gallons of water
For apple scab	When most of the buds in the cluster have separated ( <i>Fig. 5, Stages 7 and 8</i> )	Same as prepink — or — Microfine sulfur, 8 lb.
If red-banded leaf roller is serious	.....	TDE, 1 lb. actual added to above spray
If aphids are serious	.....	15% parathion, 1 lb. added to above spray ( <i>see pages 8 and 9 for precautions</i> )
If curculio is serious	.....	Dieldrin, $\frac{1}{4}$ lb. actual added to above spray

This spray is primarily for apple-scab control. Lime sulfur may be used on certain varieties, but it is not recommended for Golden Delicious or Jonathan because it may injure them. Microfine sulfur, however, is safe on these varieties. Microfine sulfur includes the many commercial brands of wettable sulfurs such as the pastes or the dry forms having particles with an average diameter of 2 to 10 microns. The organic mercury materials are excellent for this spray and are highly recommended in place of sulfur if the additional cost is not a factor. **Sulfur dusts may be used as supplements to whatever spray is used.**

Other pests which may appear at this stage of tree development are aphids, red-banded leaf roller, and curculio. If all three pests need control parathion should be added to whatever fungicide is used. If only red-banded leaf roller is present TDE should be used because it is more effective than parathion for leaf roller and is less dangerous to handle. If you have been having trouble with curculio, use the dieldrin spray, which also is much safer to use than parathion and which is specifically toxic to curculio.



## Bloom Spray

Application and purpose	Time to apply	Materials in 100 gallons of water
(DO NOT USE LEAD ARSENATE OR OTHER POISONS IN THIS SPRAY)		
For apple scab, cedar and quince rust	When 20% of blossoms have opened	Microfine sulfur, 3 lb. 70% ferbam, $\frac{1}{2}$ lb.
For fire blight	2 sprays 4 days apart starting when 10% of blossoms are open	Copper sulfate, 1 lb. Hydrated lime, 3 lb.

In most seasons the cedar galls start discharging spores at the same time that apple trees are beginning to bloom. If problem blocks are not sprayed at this time, they usually give trouble later. For, while ferbam applied as a bloom spray is especially effective in controlling the rust diseases, it cannot be relied upon to stop an infection after it has once got a good start. If rust is not a problem and cool weather prolongs the blooming period, sulfur with or without ferbam, or the organic mercury materials may be used for scab control.

Fire blight control is still a big problem. The Bordeaux spray suggested in the table will reduce blight infection but will not always give adequate control. Seventy-five percent zineb, 2 pounds in 100 gallons of water, has shown some promise in reducing blight infection and is less injurious than the Bordeaux mixture. It is more expensive than Bordeaux, however, and is still considered experimental. If blight-control measures are used in any block then the other sprays suggested for rust and scab control are not needed.

## Calyx Spray

Application and purpose	Time to apply	Materials in 100 gallons of water
For codling moth, apple scab, curculio, red-banded leaf roller, cedar and quince rust	When $\frac{3}{4}$ of petals have fallen (see Figs. 6 and 7)	Lead arsenate, 3 lb. 70% ferbam, $\frac{1}{2}$ lb. Microfine sulfur, 3 lb.
If red-banded leaf roller is serious	.....	TDE, 1 lb. actual added to above spray
If curculio is serious	.....	Dieldrin, $\frac{1}{4}$ lb. actual added to above spray

The better growers still use lead arsenate in the calyx spray. Ferbam and sulfur are adequate for disease control and are particularly

desirable on varieties susceptible to cedar and quince rust. The organic mercuries may be substituted for the ferbam and sulfur for scab control. Lime is not necessary to correct arsenical injury when ferbam or the organic mercury compounds are used as the fungicide.

A new chemical known as captan is suggested as a substitute fungicide on Golden Delicious and on varieties susceptible to fruit russet. Fifty-percent captan, 2 pounds in 100 gallons, has proved to be an excellent fungicide. Captan may be used in combination with lead arsenate without an additional safening agent. Since captan is still more expensive than other commonly used fungicides, its use should be limited to problem blocks.

When time permits, special top-off sprays are suggested after this and the following sprays. Use the same materials and apply to the top third of the tree immediately after the regular spray.



Fig. 6. (above).—Time to apply calyx spray for scab and codling moth. Petals have just fallen but calyx lobes are still open.



Fig. 7 (right).—Too late for calyx spray. Calyx lobes have closed.

## First Cover Spray

Application and purpose	Time to apply	Materials in 100 gallons of water
For curculio, codling moth, scab, blotch, rust, and leaf roller	7 days after the last spray	Lead arsenate, 3 lb. 70% ferbam, 1 lb.
If curculio is serious	.....	Dieldrin, $\frac{1}{4}$ lb. actual added to above spray
If red-banded leaf roller is serious	.....	TDE, 1 lb. actual added to above spray

If lead arsenate is used in this spray, red-banded leaf roller should not become too serious. Occasionally, however, a more effective material such as TDE is necessary. European red mite may start to build up at this time, especially where satisfactory control was not achieved in the dormant stage. If so, use a suitable mite spray, but do not use parathion as it may injure the fruit. Continue with captan, 2 pounds in 100 gallons of water, on Golden Delicious in place of ferbam if it is desired.

**CONCENTRATE SPRAYING** has saved time, labor, and materials for a good many orchard men. The theory is to use as much chemical per tree as in the standard schedules, but less water. For example, a standard recommendation for DDT might be 1 pound actual to 100 gallons. With a conventional sprayer, about 600 gallons of this mixture would be needed for an acre of orchard 25 to 30 years old. If the spray were concentrated 3 times, then 3 pounds actual of DDT would be used to 100 gallons of water, and 200 gallons would be used for an acre of orchard. Either way, 6 pounds of DDT would be applied per acre.

Tests have been conducted with as high as 10 to 12 times the normal concentration. Thus far, however, it appears that 2 to 4 times is the most practical concentration for efficient control of orchard insects and diseases.

At present, specialized equipment such as the speed sprayer, mist blower, or liquid duster is used for concentrate applications. See your dealer for the types of nozzles to use.

## Second and Third Cover Sprays

Application and purpose	Time to apply	Materials in 100 gallons of water
For curculio, codling moth, red-banded leaf roller, leaf hopper, scab, and blotch	<i>2d cover</i> , approximately 7 days after 1st cover (see spray service report) <i>3d cover</i> , 10 days after 2d cover	Lead arsenate, 2 lb. 50% DDT, 1 lb. — plus either — 70% ferbam, 1 lb. — or — Crag 341, 1 qt. — or — 50% captan, 1 lb.

The second cover is one of the most important sprays for codling-moth control because at this time of year the first egg hatch occurs and the young larvae attack the fruit. It is important to cover the apples thoroughly before egg hatch starts. Parathion should not be added to this spray because of possible fruit injury.

If you have not been entirely satisfied with ferbam, try Crag fruit fungicide 341 instead. It is an excellent fungicide and will keep such diseases as late scab, sooty blotch, fly speck, and frog-eye leaf spot to a minimum. For excellent finish on Golden Delicious, or for bitter-rot control, the captan schedule is suggested.

Watch for mite development and include a mite spray (page 20) in this application if necessary. If leaf rollers continue to be troublesome, add TDE, 1 pound actual in 100 gallons, to this spray.

## Fourth and Fifth Cover Sprays

Application and purpose	Time to apply	Materials in 100 gallons of water
For codling moth, mites, bitter rot, scale, and apple maggot	<i>4th cover</i> , 10 days after 3d cover <i>5th cover</i> , 14 days after 4th cover	50% DDT, 2 lb. — or — 15% parathion, 2 lb. — plus either — 70% ferbam, ½ lb. — or — 50% captan, 1 lb. — or — Crag 341, 1 qt.

For insect control, either DDT or parathion may be used in these sprays. If parathion is used for mite control, apply it at least twice

at 7-day intervals. This really means an extra spray between the fourth and fifth cover. For insect pests this extra spray is not needed. Parathion is one of the few materials that will destroy a codling moth larva just after it has entered the apple. The material is extremely dangerous to use, so follow the precautions listed on pages 8 and 9. Captan should be used only on Golden Delicious or in bitter-rot blocks until it is more readily available. Lead arsenate should not be used in these or in succeeding sprays because of residue problems. If mites are a problem, and parathion hasn't been used or hasn't given good control, consult the following table for suggestions.

Material	Amount in 100 gallons of water	No. of sprays necessary	Lasting effect	Toxicity to operator
"Aramite"	1½ to 2 lb.	1 or 2	3 to 4 weeks	None
"EPN"	¾ lb.	2 or 3	10 to 14 days	High
"Dimite"	1 pt.	1 or 2	3 to 4 weeks	None †
"Ovatran"	½ lb.	3 successive sprays 7 days apart	4 to 6 weeks	Low

**Special sprays.** Except in northern Illinois, special sprays for bitter-rot control may be needed at this time in blocks which have not had previous attention. Use 50-percent captan, 2 pounds in 100 gallons of water in 2 sprays — the first about 7 days after the fifth cover and the second 10 days later.

**Second- and third-brood codling moth sprays** should start about 3 weeks after the fifth cover spray. Make 2 or 3 applications of either 50-percent DDT, 2 pounds, or 15-percent parathion, 2 pounds in 100 gallons of water, at 10- to 12-day intervals. See the spray service report for more exact timing. Watch for mite development. Also, red-banded leaf roller may start damage to the fruit at this time. If so use TDE, 1 pound actual in 100 gallons.

## SUMMER APPLES

## Spray Schedule

(For dormant applications use those listed for fall and winter varieties.)

Application and purpose	Time to apply	Materials in 100 gallons of water
<b>Delayed dormant</b> , for blotch in heavily infected orchards	As late as possible, before too many leaves appear ( <i>Fig. 5, Stage 2</i> )	Copper sulfate, 12 lb. Hydrated lime, 12 lb. Miscible dormant oil, 2 gal.
<b>Prebloom</b> , for scab and curculio	When buds show pink	70% ferbam, 2 lb. Dieldrin, $\frac{1}{4}$ lb. actual
<b>Bloom</b> , for fire blight	2 sprays 4 days apart starting when 10% of blossoms are open	Copper sulfate, 1 lb. Hydrated lime, 3 lb.
<b>Calyx</b> , for scab, blotch, codling moth, and curculio	When $\frac{3}{4}$ of petals have fallen	Lead arsenate, 3 lb. 70% ferbam, $1\frac{1}{2}$ lb. Dieldrin, $\frac{1}{4}$ lb. actual
<b>1st cover</b> , for codling moth, curculio, scab and blotch	7 days after calyx	Same as for calyx
<b>2d cover</b> , for codling moth, blotch and scab	10 days after 1st cover	Same as for calyx but omit dieldrin
<b>3d cover</b> , <sup>a</sup> for codling moth	10 days after 2d cover	50% DDT, 2 lb. — or — 15% parathion, 2 lb. — or — Black leaf 155, 3 lb. Summer oil, 2 qt.

<sup>a</sup> A fourth cover is needed in some years for the second-brood codling moth. If necessary, use the Black leaf 155 and oil spray suggested for the third cover.

**A simple way to figure amount of non-concentrate spray for apple trees:** For dormant and prepink sprays, divide age of tree by 4 to find gallons needed per tree. For pink spray, divide by 3; for calyx, divide by 2; for succeeding sprays, divide by 1.5. Example: a 10-year-old tree should be given the following amounts:

Dormant and prepink stages . . . . . 2.5 gallons  
Pink stage . . . . . 3.3 gallons  
Calyx stage . . . . . 5.0 gallons  
Each succeeding spray . . . . . 6.7 gallons

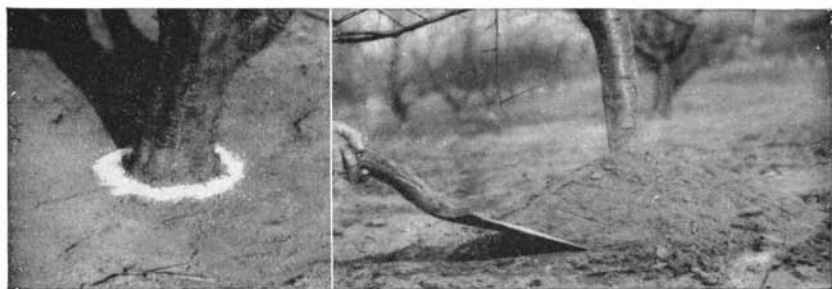


Fig. 8.— PDB treatment for peach borers consists of a “death ring” of paradichlorobenzene crystals (*left*) placed close to the trunk of the tree *but not touching the bark*. The ring of crystals is covered with a mound of earth (*right*) to confine the gas. (If you cannot obtain PDB, write to the ILLINOIS NATURAL HISTORY SURVEY, Urbana, Illinois, for directions for using ethylene dichloride.)

## PEACHES AND APRICOTS

### Borer Control

The *peach tree borer* attacks plums, cherries, and nectarines, as well as peaches and apricots. It works at the base of the tree and if not controlled annually will kill the tree. Best control method is to apply 50-percent DDT (6 pounds to 100 gallons of water) from the crotch to the base of the trunk. Starting about July 8, apply three such sprays 3 weeks apart.

Crystalline paradichlorobenzene (PDB) will also give reasonably good control. Apply it to the ground in a ring around the tree — just far enough away that it does not touch the bark — then cover it with 3 to 5 spadefuls of earth (Fig. 8). Use these amounts of PDB:

Trees 1 year old,  $\frac{1}{4}$  oz.

Trees 6 to 10 years old, 1 oz.

Trees 2 years old,  $\frac{1}{2}$  oz.

Trees older than 10 years,

Trees 3 to 5 years old,  $\frac{3}{4}$  oz.

1 to 2 oz.

Fall treatments are more effective than spring treatments. Soil temperature should be 55° F. or over to volatilize the material. In general, the best dates for treatment are from September 25 to October 15, depending on latitude and soil temperatures.

The *lesser peach tree borer* works higher on the trunk or in crotches and injured places over the tree. It can be controlled with 15-percent parathion, 3 pounds in 100 gallons of water. Make four applications 3 weeks apart, starting in mid-June. This treatment may also be used instead of DDT on the peach tree borer. PDB-oil is reasonably effective against the lesser peach tree borer. Paint affected



areas with 2 pounds of PDB crystals dissolved in 1 gallon of miscible oil, and made up to 2 gallons with water.

*Bark beetles* usually attack only weakened trees or branches, though occasionally they are found on healthy trees. Usually they can be controlled by increasing the vigor of the tree by means of fertilizers, proper drainage, or scale control. Frequently a heavy application of nitrogenous fertilizer corrects the trouble because the grubs generally do not thrive on fast-growing wood.

The treatments described for the lesser peach tree borer are also moderately effective in controlling bark beetles.

## Virus Diseases of Peaches

*Peach yellows*, *peach rosette*, *phony peach*, and *yellow-red virosis* are virus diseases of peaches known to have been present in Illinois during recent years.

Peach yellows is often harbored in the plum, where the symptoms are inconspicuous. For this reason wild plums should not be left growing near peach orchards. The yellow-red virosis is primarily a disease of chokecherry, but it may spread to peaches. So all chokecherries within half a mile of peach orchards should be destroyed. Common wild black cherry does not carry this virus.

If virus diseases are suspected, write the STATE NURSERY INSPECTION SERVICE, Glen Ellyn, Illinois, for an inspection.

**Jarring peach and apricot trees is the only good way to get information on the abundance of "catfacing" insects — the plum curculio, tarnished plant bug, and certain of the stink bugs (penatomids) — in the orchard.**

**A sudden jar of the main framework branches will make the insects fall to a sheet spread beneath the tree. They usually "play possum" long enough to be counted. Make a count on five trees — one in each of the five rows closest to the edge of the orchard (usually the insects are most numerous near the edges, especially if the orchard borders a woods). The count indicates the general insect population of the orchard and aids in deciding when to spray and how much insecticide to use. Jar the same trees once a week, keeping a record of the number of curculio and other insects collected.**

# Standard Spray Schedule for Peaches and Apricots

Application and purpose	Time to apply	Materials in 100 gallons of water
<b>Dormant</b> —for San Jose and Forbes scale, European red mite, leaf curl	In spring before the buds swell	Dormant oil, 3 gal. actual Copper sulfate, 4 lb. Hydrated lime, 3 lb.
— for scale and mites only	.....	Dormant oil, 3 gal. actual
— for leaf curl only	.....	Copper sulfate, 4 lb. Hydrated lime, 3 lb. — or — Liquid lime sulfur, 5 gal.
<b>Early bloom</b> , for brown rot, blossom blight, catfacing insects	When 5% of blossoms are open	50% DDT, 2 lb. Microfine sulfur, 3 lb. "Phygon XL," ¼ lb.
<b>Full bloom</b> , for blossom blight, catfacing insects, curculio	Full bloom	Dieldrin, ¼ lb. actual Microfine sulfur, 3 lb. "Phygon XL," ¼ lb.
<b>Shuck-split</b> , for curculio, brown rot, catfacing insects	When ¼ of shucks are splitting	Dieldrin, ¼ lb. actual Microfine sulfur, 6 lb.
<b>1st cover</b> , for curculio, scab	10 days after shuck-split	Same as shuck-split
<b>2d cover</b> , for curculio, scab	10 days after 1st cover	Microfine sulfur, 6 lb. — plus either — 15% parathion, 2 lb. (see page 8) — or — Chlordane, 1 lb. actual <sup>a</sup>
<b>3d cover</b> , for curculio, oriental fruit moth, scab, and brown rot	10 days after 2d cover	Microfine sulfur, 6 lb. — plus either — 15% parathion, 2 lb. — or — Chlordane, 1 lb. actual <sup>a</sup> 50% DDT, 2 lb.
<b>4th cover</b> , for oriental fruit moth	7 days after 3d cover	15% parathion, 2 lb. — or — 50% DDT, 2 lb.
<b>5th cover</b> , for curculio, oriental fruit moth, brown rot	1 month before harvest	Microfine sulfur, 6 lb. — plus either — 15% parathion, 2 lb. — or — Chlordane, 1 lb. actual <sup>a</sup> 50% DDT, 2 lb.
— If leaf rollers are present	.....	TDE, 1 lb. actual, added to above materials
<b>6th, 7th, and 8th covers</b> , for brown rot	21, 14, and 7 days before harvest	Microfine sulfur, 8 lb. — or — 50% captan, 2 lb.

<sup>a</sup> Injury has been reported on *apricot* trees from the use of chlordane.

## Dust Schedule for Peaches and Apricots

(For dormant application see standard spray schedule, page 24.)

Application and purpose	Time to apply	Dust formulas
<b>Early bloom</b> , for catfacing insects, blossom blight	When 5% of blossoms are open	Commercial DDT-sulfur dust (preferably containing "Phygon")
<b>Full bloom</b> , for curculio, catfacing insects, brown rot	Full bloom <sup>a</sup>	Commercial benzene hexachloride dust ( <i>see footnote b</i> ) — or — Commercial parathion dust ( <i>see footnote c</i> )
<b>Shuck-split</b> , for curculio, catfacing insects, brown rot	When shucks begin to crack	Same as for petal fall
<b>1st cover</b> , for curculio and scab	When shucks are $\frac{2}{3}$ off fruit	Same as for petal fall ( <i>see footnote d</i> )
<b>2d cover</b> , for curculio and scab	7 days after 1st cover	Same as for petal fall
<b>3d cover</b> , for curculio and scab	7 days after 2d cover	Same as for petal fall
<b>4th cover</b> , for curculio	7 days after 3d cover	Same as for petal fall
<b>5th, 6th, and 7th covers</b> , for curculio and oriental fruit moth	At 7-day intervals after 4th cover. ( <i>See spray service report for oriental fruit moth emergence</i> )	Same as for petal fall plus addition of 5% DDT if not using parathion
<b>8th cover</b> , for curculio, oriental fruit moth, and brown rot	One month before harvest	Same as for 5th, 6th, and 7th covers ( <i>see footnote d</i> )
<b>9th and 10th covers</b> , for brown rot	At 15 and 7 days before harvest	Sulfur-oil dust ( <i>see footnote e</i> )

<sup>a</sup> If blooming period is prolonged, make a second application after petal fall.

<sup>b</sup> Commercial benzene hexachloride dust should contain approximately the following ingredients: benzene hexachloride, 1.0 percent gamma; sulfur, 50 percent; oil, 5 percent; inert ingredients, 44 percent.

<sup>c</sup> A 1-percent parathion dust with sulfur has been extremely promising in tests on peaches but is highly dangerous and **should not be used unless all precautions are followed**. Parathion is safest when applied with a liquid duster. **Do not dust when the wind will carry the material into nearby residences.** For other precautions, see pages 8 and 9.

<sup>d</sup> <sup>a</sup> If red-banded leaf rollers appear spray with TDE, 1 lb. actual to 100 gallons of water.

<sup>e</sup> Sulfur-oil dust should contain approximately the following ingredients: sulfur, 65 percent; lime, 15 percent; talc, 15 percent; oil, 5 percent.

## SPRAY SCHEDULE FOR PEARS

Application and purpose	Time to apply	Materials in 100 gallons of water
<b>Dormant</b> , for pear psylla and scale	Before buds begin to open. Not needed every year	Dormant oil, 3 gals.
<b>Bloom</b> , for fire blight	2 sprays 4 days apart starting when 10% of blooms are open	Copper sulfate, 1 lb. Hydrated lime, 3 lb.
<b>Calyx</b> , for codling moth, curculio, leaf spot, and pear scab	As soon as petals have fallen	Lead arsenate, 3 lb. Hydrated lime, 3 lb. Microfine sulfur, 8 lb. — or — Lead arsenate, 3 lb. 70% ferbam, 1½ lb. Soybean flour, ¼ lb.
<b>1st cover</b> , for codling moth, curculio, leaf spot, and pear scab	10 to 12 days after calyx spray	Same as for calyx
<b>2d cover</b> , for codling moth, leaf spot, and scab	14 days after 1st cover	Lead arsenate, 3 lb. 70% ferbam, 1 lb.
<b>3d cover</b> , for codling moth, leaf spot, and scab	14 days after 2d cover	Lead arsenate, 3 lb. Copper sulfate, 1 lb. Hydrated lime, 2 lb. Summer oil, 2 qt.
<b>Additional sprays</b>		
— for codling moth and leaf spot.....	Same as for 2d-brood codling moth on apple, if necessary	Same as for 3d cover
— for psylla.....	When nymphs are visible on water sprouts	Copper sulfate, 2 lb. Hydrated lime, 4 lb. Summer oil, 6 qt. — or — 15% parathion, 2 lb. (see pages 8 and 9 for precautions)

## PLUMS

Plums are subject to only two virus diseases, *rosette* and *yellow*s. The only way to control these diseases is to remove all infected trees promptly.

*Black knot*, a fungus disease, may be controlled by removing and burning, for two successive years, all twigs showing knots during the winter months. On large limbs the knots may be cut out, thus saving the limbs. Spraying is sometimes helpful. A delayed dormant spray made of copper sulfate, 12 pounds; hydrated lime, 12 pounds; and miscible dormant oil, 2 gallons, for each 100 gallons of water should be applied as buds begin to swell. On infected trees follow this delayed dormant spray with liquid lime sulfur, using 2 gallons in 100 gallons of water for the first and second cover sprays (this will take the place of the recommended copper sulfate-hydrated lime spray).

### Spray Schedule for Plums

Application and purpose	Time to apply	Materials in 100 gallons of water
Dormant, for scale insects	Before buds begin to open	Dormant oil, 3 gal.
1st cover, for curculio	Right after shucks have fallen	Lead arsenate, 3 lb. Copper sulfate, 1 lb. Hydrated lime, 2 lb. Summer oil, 1 qt.
2d cover, for curculio	10 days after 1st cover	Same as for 1st cover
<b>Additional covers</b>		
—for brown rot.....	At weekly intervals starting 3 weeks before harvest	Microfine wettable sulfur, 8 lb.
—for aphids .....	Apply when needed	Soap flakes, 4 lb. Nicotine sulfate (40%), 1 pt.

For borer control see page 22, peach tree borer.

## SPRAY SCHEDULE FOR CHERRIES

Application and purpose	Time to apply	Materials in 100 gallons of water
<b>Dormant</b> , for Forbes scale	Before buds begin to open	Dormant oil, 3 gal.
<b>Ground spray</b> , for leaf spot	In early spring before buds begin to open. Apply to ground only. Use 500 gal. per acre	"Elgetol," $\frac{1}{2}$ gal.
<b>1st cover</b> , for brown rot, leaf spot, curculio, and slug	Right after shucks have fallen	Lead arsenate, 3 lb. — plus either — 70% ferbam, $1\frac{1}{2}$ lb. — or — Crag 341, 1 qt. Hydrated lime, $\frac{1}{2}$ lb.
<b>2d cover</b> , for same pests as 1st cover	10 days after 1st cover	Same as for 1st cover
<b>Additional sprays</b>		
— for leaf spot.....	Right after harvest	Crag 341, 1 qt. — or — 70% ferbam, $1\frac{1}{2}$ lb.
— for cherry slugs.....	In August .....	Lead arsenate, 2 lb. Hydrated lime, 6 lb.

### Thorough Spraying Is Essential for All Fruits

**Use adequate pressure.** Do not rely on measurements of pressure gages after two or more seasons of service — have the gages checked.

**Select disks with correct openings and replace worn disks.** Be sure the disks will carry the maximum load. A 35-gallon pump should discharge at least 30 gallons a minute during full operation.

**Spray tops of trees with special care.** Equip the spray rig with a tower. Apply top-off sprays when recommended.

**Examine fruit and leaves frequently.** Look for evidence of disease and insect injury. See whether spray coverage is complete, especially in tops of trees.

**Apply enough spray.** And remember that one good spray is worth more than two poor ones.

## BRAMBLES

### Sanitation

Certain diseases of brambles such as *crown gall*, *orange rust*, *mosaic*, *leaf curl*, and *bramble streak* cannot be controlled by spraying. The following practices are recommended to aid in preventing these diseases:

(1) Do not replant on a site where diseased plants have been recently grown. (2) Select resistant varieties. (3) Order planting stock from a reliable nursery. (4) Have plantings of red and black raspberries as much as 300 feet apart. (5) As soon as diseased plants are detected, dig them up with as many of their roots as possible, and burn at once. (6) At planting time cut off old stubs of 2-year-old nursery stock and "handles" of young purple and black raspberries. (7) Remove and burn old fruiting canes immediately after harvest.

For a full discussion of selection of varieties and cultural methods, see Illinois Circular 508, "Bramble Fruits."

### Spray Schedule for Brambles

Application and purpose	Time to apply	Materials in 100 gallons of water
<b>Delayed dormant</b> , for anthracnose, spur blight, mites, and rose scale	In spring after growth has started but preferably before leaflets are $\frac{3}{8}$ in. long	Liquid lime sulfur, 11 gal. — or — Dormant oil, 3 gal. Copper sulfate, 8 lb. Hydrated lime, 8 lb.
<b>Cover sprays</b> , for anthracnose, spur blight	Every 7 to 10 days after delayed dormant until prebloom	70% ferbam, 1½ lb.
<b>Prebloom</b> , for anthracnose	Immediately before bloom	Same as for cover sprays
— If fruit worms or saw-fly larvae are present	.....	Lead arsenate, 2 lb., added to above spray
<b>Postbloom</b> , for anthracnose	Immediately after bloom	Same as for cover sprays
<b>Special sprays</b> , for mites	June and early July	See page 20
<b>Post-harvest spray</b> , for anthracnose and Septoria leaf spots and mites	Immediately after harvest	70% ferbam, 1½ lb. Summer oil, 1 gal.
— If mites are serious	.....	See page 20



## CURRANTS, GOOSEBERRIES, GRAPES

### Spray Schedule for Currants and Gooseberries

Application and purpose	Time to apply	Materials in 100 gallons of water
<b>Dormant</b> , for scale insects	Before growth starts	Dormant oil, 2 gal.
<b>1st cover</b> , for currant aphids and leaf spot	When leaves start to unfold	Copper sulfate, 4 lb. Hydrated lime, 6 lb. Nicotine sulfate (40%), 1 pt.
<b>2d cover</b> , for currant worm and leaf spot	When in full foliage; do not wait for worms to appear	Copper sulfate, 4 lb. Hydrated lime, 6 lb. Lead arsenate, 2 lb.
<b>Additional covers</b> —for leaf spot.....	2 sprays 2 weeks apart, following 2d cover	Same as for 2d cover except omit lead arsenate *
—for worms feeding on plants in fruit.....	As needed	Rotenone garden dust or spray ( <i>comparatively non-poisonous to man</i> )

### Spray Schedule for Grapes<sup>a</sup>

Application and purpose	Time to apply	Materials in 100 gallons of water
<b>Dormant</b> , for scale and anthracnose	Before buds open ( <i>seldom needed</i> )	Commercial liquid lime sulfur, 7 gal.
<b>1st cover</b> , for black rot and grape flea beetle	When new growth is 2 to 4 inches long	DDT, 1 lb. actual <sup>b</sup> 70% ferbam, 1½ lb. Soybean flour, ¼ lb.
<b>2d cover</b> , for grape berry moth, rose chafer, black rot, and anthracnose	Just before the bloom	DDT, 1½ lb. actual <sup>b</sup> 70% ferbam, 1½ lb. Soybean flour, ¼ lb.
<b>3d cover</b> , for grape leaf-hopper, grape leaf folder, grape root worm, rose chafer, black rot, anthracnose, and downy mildew	After bloom, when berries are set	Same as for 2d cover <sup>c</sup>
<b>4th cover</b> , for leafhopper, black rot, anthracnose, ripe rot, mildews	3 weeks after 3d cover	Same as for 2d cover

<sup>a</sup> This schedule is based on the supposition that each application will use approximately 250 gallons of spray per acre.

<sup>b</sup> If grape mealybug is serious substitute 2 pounds of 15-percent parathion for the DDT.

<sup>c</sup> If mildew infection develops substitute one of the insoluble copper sprays for the ferbam.

## STRAWBERRIES

### Sanitation

Diseases and insects of strawberries can usually be controlled by cultural and sanitary methods. The following practices are recommended:

(1) To avoid white grubs, do not plant strawberries on sod-land until it has been under cultivation for at least two years. (2) To reduce crown borer injury, separate new beds at least 350 yards from old beds and plow up the patch after two picking seasons. (3) Choose varieties resistant to disease in so far as possible. For example, in areas where red stele root rot is common, plant varieties resistant to this disease. (4) Renovate beds immediately after each harvest.

For a full discussion of cultural and sanitation methods for strawberries, see Illinois Circular 453, "Strawberry Culture in Illinois," (revised in 1953).

### Spray Schedule for Strawberries

Application and purpose	Time to apply	Materials in 100 gallons of water
1st cover, for leaf spot, leaf roller, gray mold, weevil, and buttoning pests	First appearance of blossoms	Chlordane, $\frac{1}{2}$ lb. actual 50% DDT, 1 lb. — plus either — 50% captan, 2 lb. — or — 70% ferbam, 2 lb.
2d cover, for same pests as 1st cover	10 days after 1st cover	Same as 1st cover
3d cover, for gray mold	10 days after 2d cover	50% captan, 2 lb. — or — 70% ferbam, 2 lb.

A dust containing 5-percent DDT, 5-percent chlordane, and either 10-percent ferbam or captan is recommended for control of strawberry insects and diseases. Apply 30 pounds per acre when blooms first appear and again in 10 days. A third dust containing only ferbam or captan would help to control gray mold.

# IDENTIFICATION AND COMPATIBILITY OF PESTICIDES

## Key for Identifying New Organic Materials

Common name, brand name <sup>a</sup> or abbreviation	Chemical	Use
Aldrin	Hexachloro-hexahydro-dimethanonaphthalene	Grasshoppers; curculio (experimental)
"Aramite"	Beta-chloroethyl-beta-(paratertiary butylphenoxy)-alpha-methylethylsulfite	Mites
BHC	Benzene hexachloride	Curculio, grasshoppers
Captan	N-trichloromethyl-thiotetrahydro-phthalamide	General fungicide
Chlordane	Octachloro-methano-tetrahydroindane	Curculio, catfacing insects, grasshoppers
"Crag 341"	Heptadecyl glyoxalidine	Apple scab, cherry leaf spot, brown rot
2, 4-D	2, 4-dichlorophenoxyacetic acid	Weed killer
DD	1, 2-dichloropropane and 1, 3-dichloropropylene	Soil fumigant
DDT	Dichloro-diphenyl-trichloroethane	Codling moth, leafhoppers, oriental fruit moth, catfacing insects
Dieldrin	Hexachloro-epoxy-octahydro-dimethanonaphthalene	Curculio (experimental)
"Dimite"	Di(parachlorophenyl) methylcarbinol	Mites
"DN 111"	Dicyclohexylamine salt of 2, 4-dinitro-o-cyclohexyphenol	Mites; sooty blotch (experimental)
"DN 289"	Dinitro-o-sec-butylphenol	Dormant spray for mites, scale, and aphids
DNC	Dinitro-o-cresol	Scale, aphids on apple
"Elgetol"	Sodium dinitro-o-cresylate	Scale, aphids on apple Apple scab ground spray
"Elgetol 318" (See "DN 289")		
Ferbam	Ferric dimethyldithio-carbamate	Apple scab, blotch, cedar rust
"Krenite" (See "Elgetol")		
Lindane	Gamma isomer of benzene hexachloride	Cuculio, grasshoppers
Parathion	o-diethyl-p-nitrophenyl thionophosphate	Mites, codling moth, scale curculio, etc.
PDB	Paradichlorobenzene	Peach tree borer
"Phygon XL"	2,3-dichloro-1, 4-naphthoquinone	Peach blossom blight, apple scab
"Puratized Agricultural Spray"	Phenylmercuric triethanol ammonium lactate	Apple scab
"Puratized Apple Spray"	Phenylmercuric monoethanol ammonium acetate	Apple scab
"Tag 331"	Phenyl mercury acetate	Apple scab
TDE	Dichloro-diphenyl-dichloroethane	Red-banded leaf roller
TEPP	Tetraethyl pyrophosphate	Mites, cicadas
Toxaphene	Chlorinated camphene	Grasshoppers
Zineb	Zinc ethylene bis-dithiocarbamate	Fire blight, apple scab

<sup>a</sup> Brand names (in quotation marks) have been used only when necessary to clarify the existing confusion concerning the identity of these chemicals.

## Compatibility Chart for Orchard Insecticides and Fungicides

[illegible]

<sup>1</sup> Organic mercuries may be physically incompatible with some emulsifiable formulations.

### Key to symbols

**X** Materials can be used together.

— Materials cannot be used together.

- Materials are physically compatible and their combination does not increase their damage to plant tissue. However, they are incompatible in that the residual effectiveness of either or both would be reduced.
- 0 There is no need to use materials together, or they should not be used together because of increased toxicity to the operator

### How to use this chart

This chart is made on the same principle as a mileage chart. For instance, if you want to know whether Bordeaux mixture and DN 111 should be used together, you read down the column headed by "Bordeaux mixture" until you get to the row labeled "DN 111." The minus sign where the two meet indicates that the materials are not compatible and should not be used together.

*(Orchardists will find this kind of spray record very useful.)*

# RECORD OF MY APPLE SPRAY SCHEDULE 195\_\_

SPRAY	Started (date)	Finished (date)	Total gals. or tanks	Materials used or other remarks
Dormant				
Prepink				
Pink				
Bloom				
Calyx				
Calyx top-off				
<b>COVER</b>				
First				
Second				
Third				
Fourth				
Fifth				
Sixth				
Sixth top-off				
<b>SECOND BROOD</b>				
First				
Second				
Third				
Fourth				

# RECORD OF MY PEACH SPRAY OR DUST SCHEDULE 195\_\_

SPRAY or DUST	Started (date)	Finished (date)	Wind direc- tion	Amount of material used	Materials used or other remarks
Dormant					
Prebloom					
Bloom					
Shuck-split					
<b>COVER</b>					
First					
Second					
Third					
Fourth					
Fifth					
Sixth					
Seventh					
Eighth					
Ninth					
Tenth					
Eleventh					

## Weekly Report on Orchard Insects and Diseases

**Radio programs.** Each Monday noon the ILLINOIS FARM HOUR gives latest information on controlling orchard pests. This program originates at W-I-L-L, the University of Illinois Radio Station, 580 on your dial.

Many other stations give similar service. Consult your local station, your farm adviser, or the Illinois Agricultural Experiment Station, Urbana, for details.

**Reports by mail.** Mimeographed copies of *The Spray Service Report*, carrying the same information as the radio programs, will be sent to Illinois orchardists under free mailing privilege at no cost to them. Anyone wishing to receive these weekly releases by faster mail may send \$1.00 to the Illinois Agricultural Extension Service, Mumford Hall, Urbana, Illinois, to pay for first-class mailing. (Either stamps or checks payable to the University of Illinois are acceptable.)

Out-of-state growers will be furnished this information under postage at the above rates if the total number of requests is not too large.

These weekly reports are prepared by the agricultural experiment stations of Indiana, Kentucky, and Illinois, the Kentucky State Horticultural Society, the Federal Deciduous Fruit Insect Laboratory at Vincennes, Indiana, and the Illinois State Natural History Survey.

It is probable that the federal government will establish spray-residue tolerances for DDT, TDE, parathion, and chlordane, as well as all other poisonous agricultural chemicals, by harvest-time, 1953. If these materials are used in the concentrations and at the times suggested in this circular, there should not be excessive spray-residue on the fruit at harvest. **Do not use such materials within one month of harvest**, for there is no evidence as yet that heavy residues can be removed by washing.